

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPOF

Form Approved
OMB No 0704-0188

1a REPORT SECURITY CLASSIFICATION Unclassified		1b RESTRICTIVE MARKINGS None	
2a SECURITY CLASSIFICATION AUTHORITY N/A		2b DECLASSIFICATION/DOWNGRADING SCHEDULE 22.1994	
4 PERFORMING ORGANIZATION REPORT NUMBER(S) DOD POP HMTR/AYD 94-028		5 MONITORING ORGANIZATION REPORT NUMBER(S) None	
6a. NAME OF PERFORMING ORGANIZATION Packaging Division	6b. OFFICE SYMBOL (If applicable) SMCAR-AEP	7a. NAME OF MONITORING ORGANIZATION None	
6c. ADDRESS (City, State, and ZIP Code) U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER Picatinny Arsenal, NJ 07806-5000		7b. ADDRESS (City, None	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Same as 6a.	8b. OFFICE SYMBOL (If applicable) SMCAR-AEP	9. PROCUREMENT II	
8c. ADDRESS (City, State, and ZIP Code) Same as 6c.		10. SOURCE OF FUNDING NUMBERS	
		PROGRAM ELEMENT NO.	PROJECT NO.
		TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) Performance Oriented Packaging (POP) Testing of 60mm HE M888 Mortar Cartridge, Packed sixteen (16) in a Wood Wirebound Box			
12. PERSONAL AUTHOR(S) Oltea L. Bogdan			
13a. TYPE OF REPORT Final	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 940907	15. PAGE COUNT
16. SUPPLEMENTARY NOTATION			

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	1. Performance Oriented Packaging 4. PA70 Metal Container 2. Wood Wirebound Box 3. PA73 Fiber Container	
19. ABSTRACT (Continue on reverse if necessary and identify by block number)				

This report covers the POP tests performed on wood wirebound box fabricated per MIL-B-46506. This wirebound box is being used as shipping and storage container of various 60MM Mortar Cartridges. The wirebound box tested (P/N 9280108) contained two metal containers PA70 (P/N 9252724). Each metal container contained eight cartridges. Each cartridge is packaged in spirally wound fiber container PA73 (P/N 9280110). The tests were conducted in accordance with Performance Oriented Packaging (POP) requirements specified by the United Nations, "Transportation of Dangerous Goods" and the Code of Federal Regulations, Title 49 CFR, Parts 107 through 178.

DTIC QUALITY IMPROVED 3

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT.	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Oltea L. Bogdan	22b. TELEPHONE (Include Area Code) 201-724-2220
22c. OFFICE SYMBOL SMCAR-AEP	

I. Report Number: DOD POP HMTR/AYD 94-028

II. Title: Performance Oriented Packaging (POP) Testing of 60mm HE
M888 Mortar Cartridge, Packed sixteen (16) in a Wood
Wirebound Box

Drawing Number: 9280108

Author: Oltea L. Bogdan

Performing Activity: U.S. Army Armament Research, Development
and Engineering Center (ARDEC)

Address: Department of the Army
Commander, U.S. Army ARDEC
Attn: SMCAR-AEP
Picatinny Arsenal, N.J. 07806-5000

Date: September 1994

Distribution Statement A.

Approved for public release; distribution is unlimited.

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution _____	
Availability Codes	
Dist	Avail and/or Special
A'	

I. Data:

Container:

Type: Box, Wirebound
 Code: 4C1
 Specification: MIL-B-46506
 Drawing Number: 9280108/9317918
 Material: Wood
 Maximum net mass: 50 kg (110 lbs)
 Dimensions:
 Inside: 31.91 cm X 30.80 cm X 42.39 cm
 (12 9/16 in X 12 1/8 in X 16 11/16 in)
 Outside: 37.94 cm X 33.50 cm X 45.09 cm
 (14 15/16 in X 13 3/16 in X 17 3/4 in)
 Closure Method/Type: 1 Flat strapping or
 2 Galvanized Round Steel Tying Wire
 Gross Weight: 59 kg (130 pounds)
 Tare Weight: 7.7 kg (17 pounds)

Additional description: Each cartridge is packed in PA73 or PA78 Fiber Container in accordance with drawing 9280110/9293287. Eight fiber containers are packed in the PA70 Metal Container in accordance with drawing 9280109 or 9252724. Two metal containers are overpacked in the wirebound box in accordance with drawing 9280108/9293440.

Product:

1. Name: Cartridge 60MM, HE M888 W/Fuze, PD M935
 Drawing Number: 9354430
 Cage Code: 19200
 National Stock Number: 1310-01-149-3185
 DOD Identification Code: B643

Proper Shipping Name: CARTRIDGES FOR WEAPONS
 United Nation Identification Number: 0321
 United Nation Packaging Group: II
 Hazard Classification/Division: 1.2E
 Physical State: Solid

2. Name: Cartridge 60MM, Smoke, WP M302A2
 Drawing Number: 12903088
 Cage Code: 19200
 National Stock Number: 1310-01-240-9253
 DOD Identification Code: B630

DTIC QUALITY INSPECTED 4

Proper Shipping Name: AMMUNITION, SMOKE, WHITE PHOSPHORUS
United Nation Identification Number: 0245
United Nation Packaging Group: II
Hazard Classification/Division: 1.2H
Physical State: Solid

3. Name: Cartridge 60MM, Illuminating, M83A3 W/Fuze
Time, M65A1
Drawing Number: 9207516
Cage Code: 19203
National Stock Number: 1310-00-113-5911
DOD Identification Code: B627

Proper Shipping Name: AMMUNITION, ILLUMINATING
United Nation Identification Number: 0171
United Nation Packaging Group: II
Hazard Classification/Division: 1.2G
Physical State: Solid

4. Name: Cartridge 60MM, HE, M720 W/Fuze, MO M734
Drawing Number: 9275526
Cage Code: 19203
National Stock Number: 1310-01-022-7680
DOD Identification Code: B642

Proper Shipping Name: CARTRIDGES FOR WEAPONS
United Nation Identification Number: 0321
United Nation Packaging Group: II
Hazard Classification/Division: 1.2E
Physical State: Solid

5. Name: Cartridge 60MM, Smoke, WP, M722 W/Fuze PD M745
Drawing Number: 12902791
Cage Code: 19200
National Stock Number: 1310-01-236-1354
DOD Identification Code: B646

Proper Shipping Name: AMMUNITION, SMOKE, WHITE PHOSPHORUS
United Nation Identification Number: 0246
United Nation Packaging Group: II
Hazard Classification/Division: 1.3H
Physical State: Solid

II. Reference Material:

- a. Federal Register, "49 CFR Part 107-179"
- b. United Nations, "Transport of Dangerous Goods"

III. Background:

This Performance-Oriented Packaging (POP) test was performed to ascertain whether the MIL-B-46506 wood wirebound box used for shipping and storage of various 60MM Cartridges met the Packaging Group II requirements specified by the Code of Federal Regulations Title 49, Part 107 through 179 dated 1 October 1993.

The box tested conforms to MIL-B-46506, Type II, Class 1, Grade A and contains sixteen cartridges each; the cartridge is packaged in a fiber container and eight packaged fiber containers are packed in a metal container. Two metal containers then packed in the wirebound box. One steel strap is used to secure the wood wirebound box during the tests.

IV. Tests Performed

The following POP tests were performed at ambient temperature:

1. Vibration Test

Procedure:

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.608. Two loaded and closed wirebound boxes packed as for shipment were placed on a vibrating platform. The vertical double-amplitude of the vibrating platform was one inch at a frequency of 275 cycles per minute. The test duration was one hour. The frequency was sufficient to allow the package to become completely airborne and enable a 1/16" piece of strapping material to be slid underneath the package during the vibration.

Pass Criteria

Immediately following the vibration test, each container should be removed from platform, turned on its side and examined for any evidence of leakage. All containers should remain securely closed with no evidence of leakage of contents.

Results:

After the tests, the wirebound boxes experienced no structural damage; there was no spillage of contents; the passing criteria was met.

2. Stacking Test

Procedure:

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.606. Three different wirebound boxes were used, each loaded with a stack weight of 1197 pounds. This simulated the weight imposed on the bottom container of a ten-foot stack of identical containers. The test was performed for 24 hours.

Pass Criteria:

After the required time, the weight should be removed and the container examined for any evidence of leakage, deterioration or distortion.

Results:

During the test, the containers supported the loads adequately. No structural damages were found on the tested container. The passing criteria is met.

3. Drop Test

Procedure:

The test is performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.603. One container is used for each drop orientation. The drop height is 1.2 meters (four feet) with the following orientations:

- a. Flat on Bottom
- b. Flat on Top
- c. Flat on Long Side
- d. Flat on Short Side
- e. On a Corner

Pass Criteria:

The contents of the container should be retained within its package and exhibit no damage liable to affect safety during the transportation.

Results:

There was no visible damage on the first four drops. On the fifth drop (on a corner), the impact corner received minor indentation. Also, minor cracks were observed on the top panel of the wirebound box. However, the container was in a sound condition. All contents remained inside the container and package was capable of being handled without danger of spillage. It was determined that the containers met the passing criteria of CFR 49.

V. Based on the above POP testing results, the following POP symbol has been applied to wirebound box in accordance with drawing 9280108 or 9293440.

u
n
4C1/Y59/S/[_ _]
USA/DOD/AYD

Insert the last two digits
of year packed.